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TERMINAL FORECAST REFERENCE NOTEBOOK

26TH WEATHER SQUADRON

DETACHMENT 12

PLATTSBURGH AFB, NY

1 AUG 1980

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This Terminal Forecast Reference Notebook has been reviewed and is approved for publication.

FOR THE COMMANDER

Gale L. Gabbert

GALE L. GABBERT, Major, USAF
Aerospace Sciences Officer

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This publication provides weather forecasting guidelines for Plattsburgh Air Force Base, New York. It covers the local topography, pollution sources, the meteorological instrumentation, climatology, and predominant seasonal weather regimes. Local forecast studies and forecasting rules of thumb are included.

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SECTION A

TOPOGRAPHY

ATMOSPHERIC POLLUTION SOURCES

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TOPOGRAPHY

The Plattsburgh AFB runway lies within two miles of the upper west side of Lake Champlain with the Adirondack Mountains lying 20 to 30 miles to the west and south. The Green Mountains of Vermont are 25 to 40 miles to the east. The southern edge of the relatively broad and flat St. Lawrence Valley lies about thirty miles to the north. This topography channels the stronger winds from the west-northwest and south-southeast quadrants to such an extent that winds of greater than ten knots frequently blow across the surface isobars at angles of from 60 to 90 degrees. It also preclude winds greater than 10 knots from an easterly (030-140) component or southwesterly (210-230) except in rare instances

The Green and Adirondack mountains frequently serve to hold ceilings above the mean to be expected from easterly, southerly or southwesterly air flow due, apparently, to a rather marked lee-side effect.

Lake Champlain has only a minor effect on the local flying weather and that occurs during late fall and early spring when the maximum air mass-water temperature differential exists.

There are, in addition to the larger topographical features, two very local minor ones which evidently contribute markedly to the rather good local terminal conditions. First, the airfield proper is located on a slight ridge with drainage in all directions. The north end of the runway is approximately 90 feet higher than the south end. A second feature is that the airfield is built on a sand bar deposited by the Saranac River and Lake Champlain at some time in geological history. Rain or melting snow therefore drains and sinks rapidly and the surface becomes relatively dry within one or two hours following cessation of precipitation or melting.

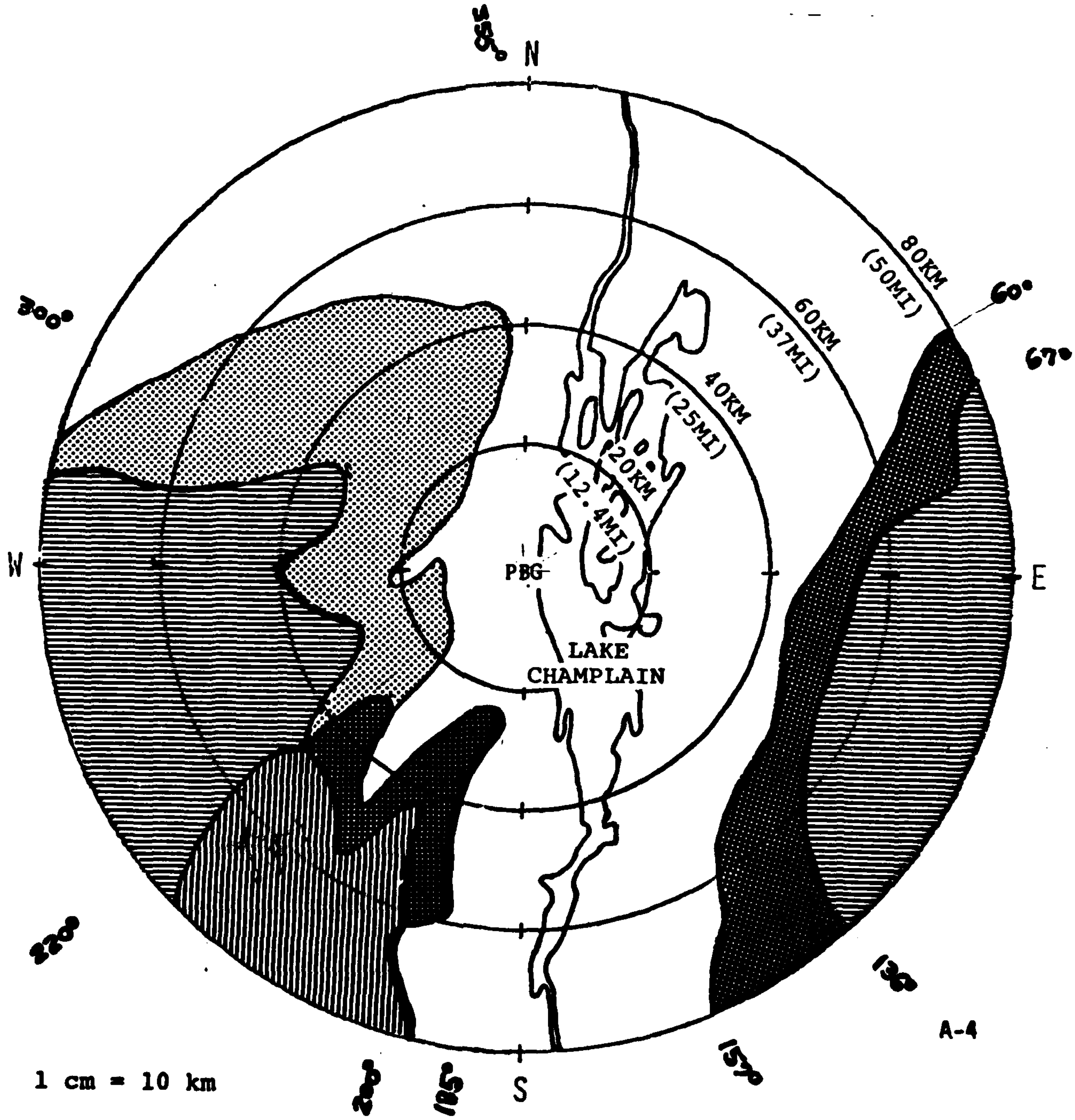
TOPOGRAPHICAL INFLUENCES

(FOR AIR APPROACHING THE STATION)

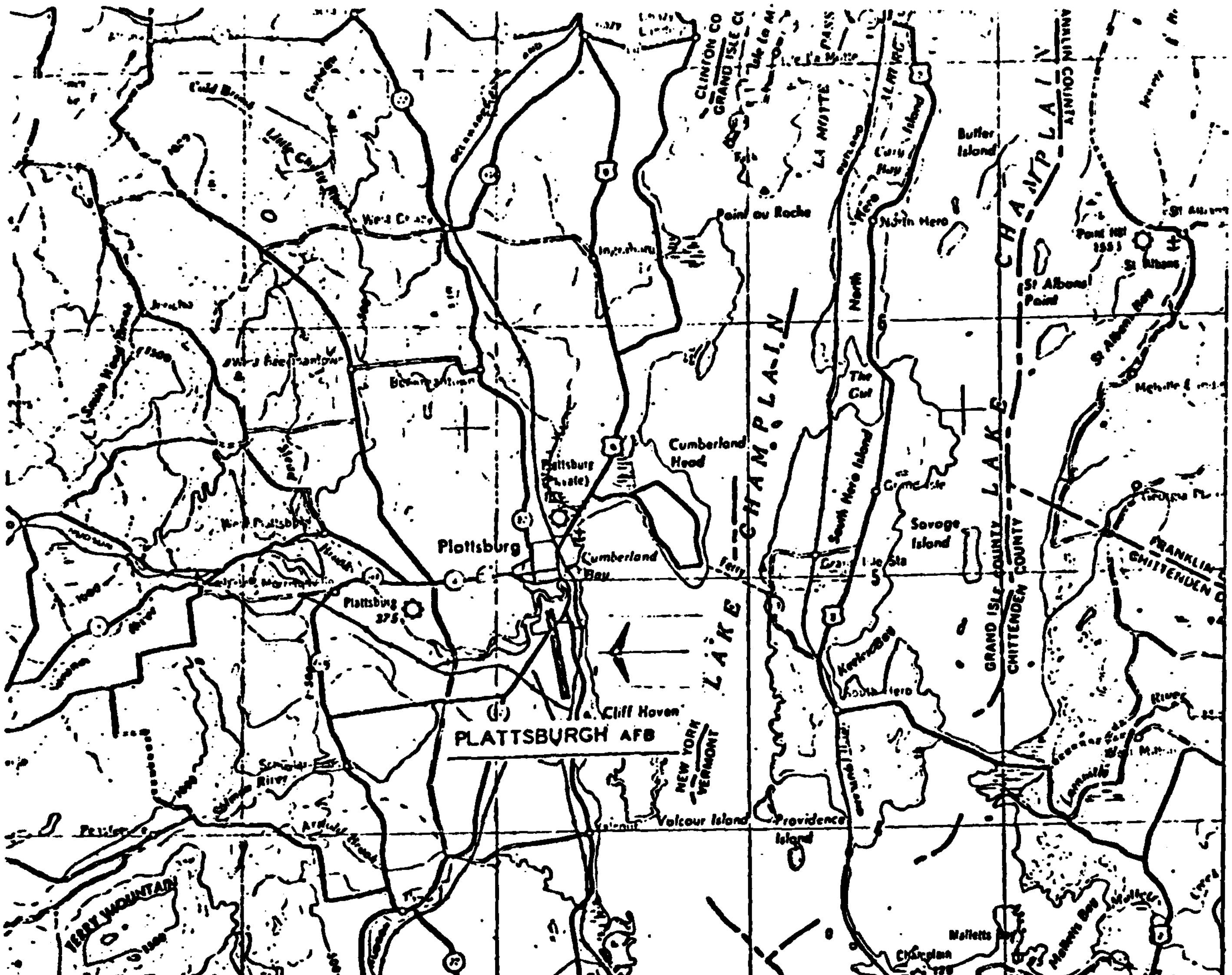
DOWNSLOPE: Moderate — Strong or Abrupt,

UPSLOPE: Moderate — Strong or Abrupt,

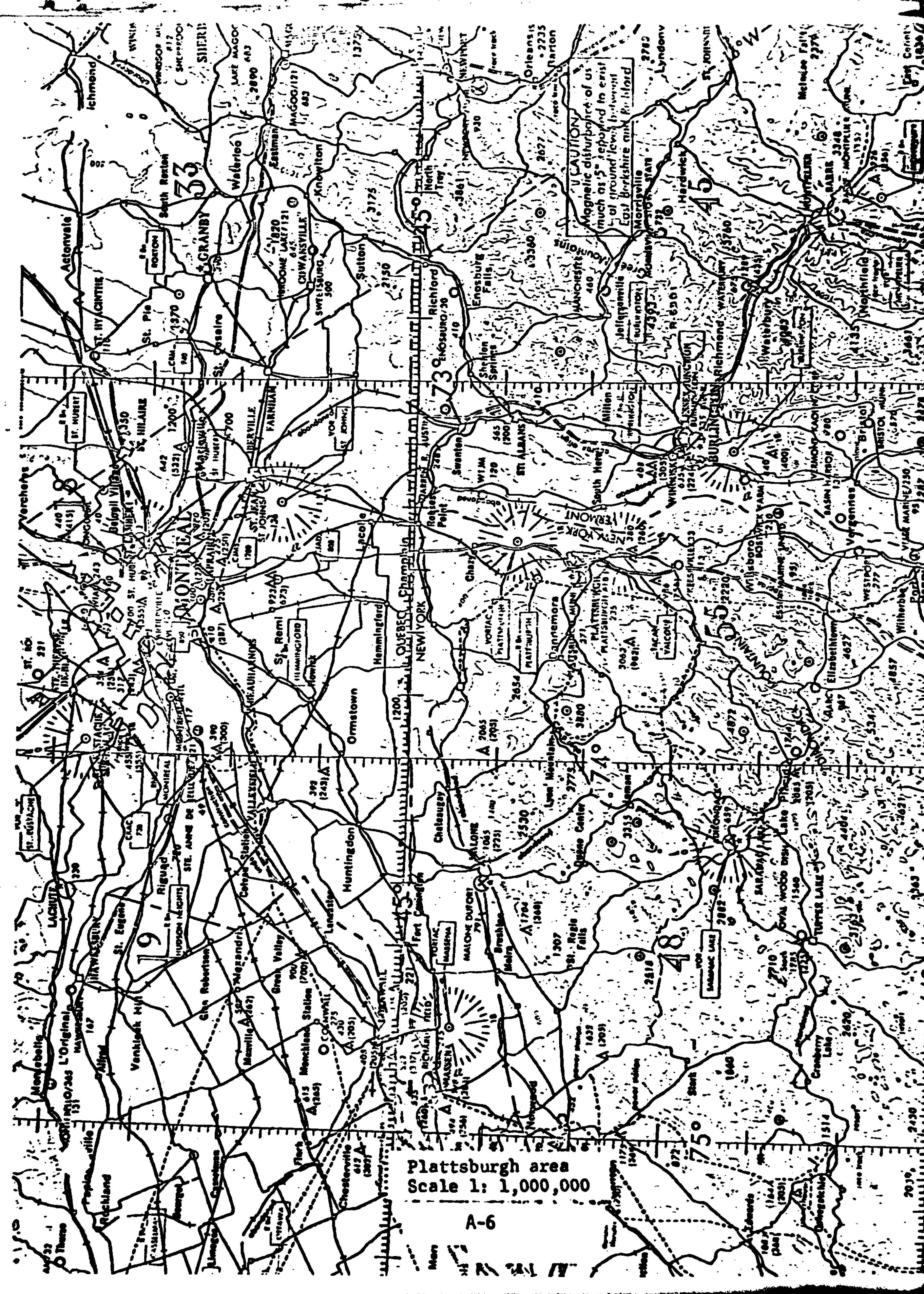
Near Level Terrain — Pollution Source NONE



1 cm = 10 km



Plattsburgh AFB Area
Scale 1: 250,000



Plattsburgh area
Scale 1: 1,000,000

A-6

ATMOSPHERIC POLLUTION SOURCE

During the summer, haze or smog is advected over the area from industrial regions well southwest of Plattsburgh, i.e., western PA. Whenever southerly flow persists over the area for two days or more visibilities will decrease to 2 miles or somewhat less during the day and 5 miles at night. About four or five occurences per summer may be expected. These are the only significant pollution sources at the base.

INSTRUMENTATION

EXPOSURE OF OBSERVING INSTRUMENTS

The weather station is located in the Base Operations building (2712) which is west of the main base.

The Basic Weather Watch (BWW) is conducted from the Base Weather Station located on the ground floor of the Base Operations building. Visibility markers are limited in almost every quadrant. The limits are east 1 mile, north 1 mile, west 12 miles, west-northwest 21 miles, and south 10 miles. The Tower Operator will assist the weather observer when visibilities drop below 5 miles.

The following instruments are available at Plattsburgh.

1. Wind Measuring Set (AN/GMQ-20). One transmitter is located 750 feet east of the centerline and 1775 feet south of the north end of the runway. The other transmitter is located 500 feet east of the centerline and 1200 feet north of the soth end of the runway. Transmitter readouts are located in the Tower, Base Weather Station and GCA Van. Both sets became operational 21 Jun 63. Speed is recorded in one knot increments from zero to 120 knots. Wind direction is recorded in ten degree intervals magnetic. These transmitters are located in an unobstructed area, free from the effects of trees, buildings and other obstructions. The wind sets are calibarted every three months to insure accurate wind speed and direction readings.

2. Transmissometer (AN/GMQ-10). One projector is located 750 feet east of the centerline and 1200 feet north of the south end of the runway. The detector is 500 feet further north. This transmissometer became operational 21 Jun 63. A second projector is located 750 feet east of the centerline and 1500 feet south of the north end of the runway.

The detector is 500 feet further south. This set became operational 19 Dec 62.

The transmissometer is used to measure runway visibilities in the touchdown zones of runways 17 and 35. In general it gives a more reliable touchdown visibility than the reported prevailing visibility. Runway visibility measurements are recorded as runway visual range in hundreds of feet up to 6000 feet. For higher visibilities, the trend indication is valuable with the accuracy decreasing with increasing visibilities. The GMQ-10 recorder and FMN-1 computer are located in the Base Weather Station.

3. Temperature-Humidity Set (AN/TMQ-11). The sensor is located 1530 feet north of the south end of the runway and 850 feet east of the centerline. The indicator is located in the Base Weather Station. The TMQ-11 became operational 27 Jan 61. The set indicates (but does not permanently record) free air temperature and dew points continuously with an accuracy of one-half degree. These values are reported in whole degrees fahreheit.

4. Wet and Dry Bulb Thermometer. They are only utilized during periods when the AN/TMQ-11 indicator is out for maintenance or the reading is suspect and a cross-check is desired wither by the observer or the forecaster.

5. Rain Gauge (ML-17). This is located about 200 feet south-east of the south end of building 2712.

6. Rotating Beam Ceilometer (AN/GMQ-13). The set became operational 19 Dec 60. The detector is located on the centerline 4500 feet north of the north end of the runway. The projector is 400 feet

further north. The second detector is located on the centerline 2640 feet south of the south end of the runway. The projector is 400 feet further south. This set became operational 21 Jun 63. These sets provide continuous measurements of cloud bases to 3700 feet or 3800 feet. The indicator scope is located in the Base Weather Station. The following increments are reported.

NORTH END	SOUTH END
100 foot increments to 1600 feet	100 foot increments to 1600 feet
1800 feet	1800 feet
1900 feet	2000 feet
2100 feet	2200 feet
2300 feet	2400 feet
2500 feet	2800 feet
2900 feet	3200 feet
3300 feet	3700 feet
3800 feet	

Estimated ceilings can be determined up to 5500 feet but the accuracy decreases as the ceiling increases.

7. Mercurial Barometer (ML-2). This instrument is located on an eye-beam in the weather station supply room building 2712. Readings are reported to 0.001" of mercury with appropriate corrections.

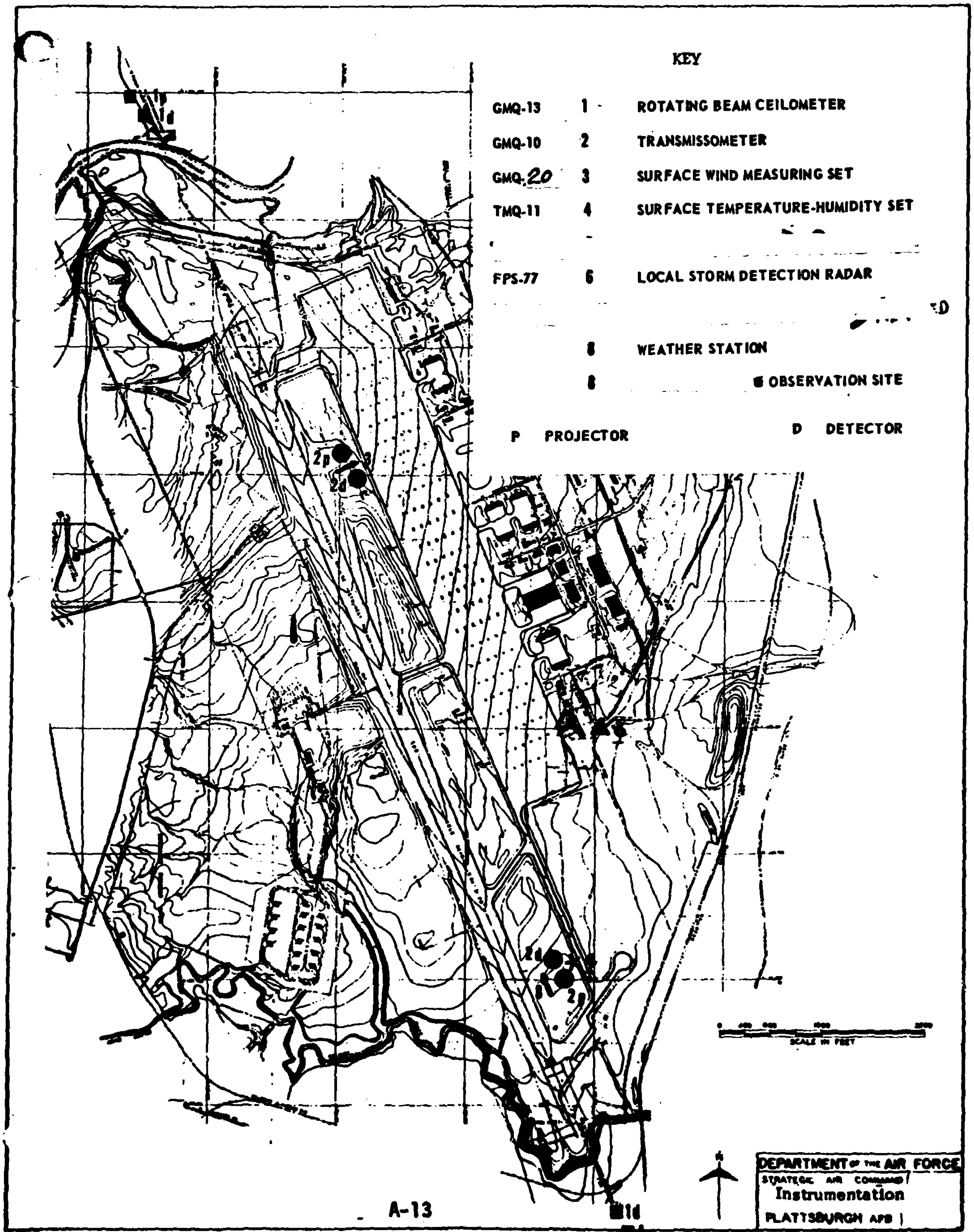
8. Barograph (ML-563A). This is located in the Base Weather Station. A continuous graph of pressure accurate to 0.005" of mercury can be maintained; however, the barograph is checked against the mercurial barometer every six hours and reset only when the aneroid barometer is

faulty.

9. Computer (FMN-1). The system operates in conjunction with the transmissometers located at either end of the runway. The computer set presents runway visual range readings as a one minute mean on either runway 17 or 35. Runway visibility is measured from 1000 to 4000 feet in 200 foot increments and from 4000 to 6000 feet in 500 foot increments. In addition the readout will indicate a value greater than 6000 feet or less than 1000 feet. The indicator is located in the Base Weather Station.

10. Aneroid Barometer. This set is located in the Base Weather Station. It measures pressure to 0.1mb. The barometer is checked against the mercurial barometer weekly with the correction applied to the reading. If the error is greater than 0.3mb the instrument is adjusted by the maintenance shop.

11. Local Storm Detection Radar (FPS-77). The antenna is located on a 100 foot tower 200 feet east southeast of the Base Operations building. The receiver is located in the forecasting area. The console has three indicator displays, PPI, RHI, and A/R. The set can scan either vertically or horizontally. It will detect areas of precipitation, including rain and snow, thunderstorms, heavy cloud areas and under certain conditions anomalous propagation echoes. Anomolous propagation can usually be detected only in the northeast quadrant. The unit has a maximum range of 200 nautical miles horizontally and can determine tops to 80,000 feet. Echoes within five miles of the antenna are essentially blocked on the PPI but can be detected on the RHI scope. There is a capability to take photos of any presentation. However, only the PPI scope is utilized regularly.


KEY
GMQ-13 1 ROTATING BEAM CEILOMETER
GMQ-10 2 TRANSMISSOMETER
GMQ-20 3 SURFACE WIND MEASURING SET
TMQ-11 4 SURFACE TEMPERATURE-HUMIDITY SET
FPS-77 6 LOCAL STORM DETECTION RADAR
WEATHER STATION
OBSERVATION SITE
P PROJECTOR
D DETECTOR
SCALE IN FEET
DEPARTMENT OF THE AIR FORCE
STRATEGIC AIR COMMAND
Instrumentation
PLATTSBURGH AFB

SECTION B

CLIMATOLOGY

AWS CLIMATIC BRIEF	PLATTSBURGH AFB, NEW YORK	PERIOD: 1956-67	WBAN # 04742
Prepared by ETAC (OCT 1970)	N 44 39 W 73 28	ELEVATION: 245 ft	WMO # STN LTRS: KPBG

MONTH	TEMPERATURE (°F) EXTREME MAXIMUM	TEMPERATURE (°F) MEAN DAILY MAXIMUM	TEMPERATURE (°F) MEAN DAILY MINIMUM	TEMPERATURE (°F) EXTREME MINIMUM	PRECIPITATION (in) MEAN TOTAL	PRECIPITATION (in) MAXIMUM IN 24 HOURS	PRECIPITATION (in) MEAN SNOWFALL	PRECIPITATION (in) MAX SNOWFALL IN 24 HOURS	WIND (KT) PREVAILING DIRECTION	WIND (KT) MEAN SPEED	WIND (KT) EXTREME SPEED (Peak) (Gusts)	MEAN RELATIVE HUMIDITY (%) 0400	MEAN RELATIVE HUMIDITY (%) 1300	MEAN DEW POINT (°F)	MEAN VAPOR PRESSURE (in Hg)	PRESSURE ALTITUDE 99.95% (Feet)	MEAN NUMBER OF DAYS PRECIP ≥ 0.01 in	PRECIP ≥ 0.5 in	SNOWFALL ≥ 0.1 in	SNOWFALL ≥ 1.5 in	THUNDERSTORMS	FOG (< 7 Miles)	TEMPERATURE (°F) MAXIMUM ≥ 90	MAXIMUM ≥ 80	MINIMUM ≤ 32	MINIMUM ≤ 0	MEAN CLOUDS (Tenths)
JAN	58	26	8	-29	1.8	1.8	16	18	W	6	58	72	66	10	.06	1050	11	1	11	2	0	5	0	0	30	8	7
FEB	53	28	9	-25	1.7	1.0	14	10	W	7	40	72	64	10	.06	1150	10	1	9	3	0	7	0	0	27	7	7
MAR	73	37	21	-12	1.8	1.3	13	10	WNW	7	44	74	60	19	.10	1000	10	1	7	3	#	7	0	0	27	1	6
APR	89	51	34	10	2.0	1.0	3	8	W	7	52	75	55	30	.16	1050	11	1	2	1	1	8	0	#	11	0	7
MAY	95	65	44	24	2.3	1.4	#	2	SE	7	47	77	53	41	.26	800	10	1	#	#	3	6	#	3	2	0	6
JUN	97	74	54	33	2.6	1.5	0	0	SE	6	39	80	57	53	.40	800	10	2	0	0	5	6	2	8	0	0	6
JUL	99	78	59	41	2.8	1.9	0	0	SE	5	39	82	58	57	.47	750	11	1	0	0	7	6	1	13	0	0	6
AUG	95	76	56	36	2.8	2.2	0	0	SSE	5	39	83	59	56	.45	700	9	2	0	0	5	6	#	10	0	0	6
SEP	90	69	49	28	2.4	3.0	#	#	SSE	5	45	85	61	50	.36	800	9	1	0	0	2	7	#	4	1	0	6
OCT	86	57	39	17	2.5	1.2	#	1	SSE	6	43	78	61	39	.24	900	10	2	#	0	#	7	0	#	6	0	6
NOV	71	45	30	1	1.9	0.9	4	7	W	6	47	79	68	30	.16	1100	12	1	3	1	#	8	0	0	17	0	7
DEC	61	30	15	21	2.0	1.1	14	18	W	6	42	76	69	17	.09	1050	13	1	11	2	#	7	0	0	27	4	7
ANN	99	53	35	-29	26.6	3.0	64	18	W	6	58	78	61	34	.20	950	126	15	43	12	23	80	3	38	148	20	6
EYR	10	10	10	10	10	10	10	10	11	11	7	10	10	11	11	11	10	10	10	10	10	10	10	10	10	10	11

REMARKS

RUSSWO POR: HRLY OBS: Jan 56 - Apr 67 Extreme values updated through 1979
DAILY OBS: Jan 56 - Jun 65

NOTE; *DATA NOT AVAILABLE. #LESS THAN 0.5 DAY, 0.5 OR 0.05 INCH, OR 0.5 PERCENT (%) AS APPLICABLE.

FLYING WEATHER (% FREQ)	HOURS (LST)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN	EYR
CIG less than 3000 feet and/or VSBY less than 3 miles	00 - 02	18	15	13	14	5	5	2	4	7	10	17	22	11	
	03 - 05	19	16	14	15	7	7	3	5	8	10	18	22	12	
	06 - 08	20	21	16	16	11	8	6	7	12	12	19	24	14	
	09 - 11	21	21	16	16	10	8	6	7	11	13	21	22	14	
	12 - 14	18	18	14	16	8	6	5	7	8	12	21	19	13	
	15 - 17	18	18	14	14	6	4	4	6	6	10	20	22	12	
	18 - 20	17	17	13	14	5	6	3	4	6	9	20	21	11	
	21 - 23	16	17	12	11	4	5	2	4	7	10	19	24	11	
	ALL HOURS	18	18	14	15	7	6	4	5	8	11	19	22	12	11
CIG less than 1500 feet and/or VSBY less than 3 miles	00 - 02	9	8	7	7	3	2	1	2	3	5	9	8	5	
	03 - 05	10	8	8	8	2	5	2	2	3	5	9	8	6	
	06 - 08	11	11	9	8	5	6	3	4	6	5	9	12	7	
	09 - 11	12	14	10	9	3	4	3	3	5	6	11	13	8	
	12 - 14	10	11	9	6	3	2	1	2	3	5	9	12	6	
	15 - 17	12	12	8	6	3	2	1	2	3	5	8	11	6	
	18 - 20	9	11	8	4	2	3	2	2	3	5	6	9	5	
	21 - 23	7	10	6	5	2	2	1	3	3	5	7	9	5	
	ALL HOURS	10	10	8	7	3	3	2	3	4	5	9	10	6	11
CIG less than 1000 feet and/or VSBY less than 2 miles	00 - 02	6	6	5	4	2	1	1	2	1	4	6	5	4	
	03 - 05	7	5	4	5	2	3	1	#	2	3	5	6	4	
	06 - 08	8	7	5	5	2	3	2	2	3	4	6	8	5	
	09 - 11	8	10	7	6	1	1	1	1	2	4	7	8	5	
	12 - 14	8	8	7	4	2	1	1	1	1	2	5	7	4	
	15 - 17	9	9	7	4	2	#	#	1	1	2	6	7	4	
	18 - 20	6	8	6	3	2	1	1	1	1	3	4	7	4	
	21 - 23	5	7	5	4	2	1	1	2	1	3	4	6	3	
	ALL HOURS	7	8	6	4	2	1	1	1	2	3	6	7	4	11
CIG less than 200 feet and/or VSBY less than 1/2 mile	00 - 02	#	#	#	#	#	0	0	#	#	#	1	1	#	
	03 - 05	0	1	#	1	0	#	#	#	0	#	1	1	#	
	06 - 08	#	1	1	1	#	0	0	#	#	1	1	1	1	
	09 - 11	1	1	1	#	0	0	0	0	0	#	#	1	#	
	12 - 14	1	1	1	1	0	0	0	0	0	0	#	1	#	
	15 - 17	1	1	1	#	0	#	0	0	0	0	0	1	#	
	18 - 20	1	1	1	#	#	0	0	0	0	#	#	1	#	
	21 - 23	#	1	#	#	#	0	0	#	0	#	1	1	#	
	ALL HOURS	1	1	1	#	#	#	#	#	#	#	1	1	#	11

INTRODUCTION

Plattsburgh has by far the best flying weather of any military base in the Northeast. For example, the percentage frequency of ceilings and visibilities below 1000/2 are compared for three other bases in the area:

	PBG	RME	PSM	LIZ
Jan	7	14	13	15
Feb	8	15	13	14
Mar	6	11	13	11
Dec	7	14	14	17
Average Total (year)	4	8	11	13

Still there are several critical forecast problems at Plattsburgh.

1. Gusty surface winds
2. Thunderstorms.
3. Precipitation type.
4. Snow accumulation.

The local topography has a very important influence upon most of the weather regimes affecting the area. Ceilings are frequently considerably higher than other stations in the area. This is probably due to the leeside effects of the hills to the west of the base. Lake Champlain influences the weather only with easterly low-level flow patterns and the frequent lake breeze effect.

Radiation fog is a rare occurrence because the runway is higher at the northend and slopes downward in all directions. This resulting drainage precludes any signficant radiation fog even though the area surrounding the runway complex has considerable fog.

SECTION C

WEATHER REGIMES

SECTION C SEASONAL WEATHER REGIMES

Plattsburgh has four definite seasons each year. However; the time frames can vary widely from year to year. Winter can extend from mid November to early April with January and February the coldest months. Spring may extend from early April to mid June, summer from mid June to early September and fall from early September to early December. Weather patterns are extremely variable throughout the year. Climatology is not the reliable tool it is in more southern climes. The location of the polar jet, long wave pattern and surface synoptic situation vary widely throughout the year.

SUMMER WEATHER REGIMES

Climatology: Ceilings and visibilities are predominately above 3000/3; i.e., July 93% of the time; August 91%; and June 90%. Surface winds above 35 knots are extremely rare; statistically occurring 0% of the time. The few cases that do occur happen with moderate or greater thunderstorms. When the polar jet stream is south of the area, relatively cool weather prevails with considerable rain. Frequent frontal systems pass thru the area. When the jet is north of the area mT air tends to dominate the region as the Bermuda high develops over the eastern US. Temperatures and the moisture content increase and thunderstorms and haze become more prevalent during this regime. The computer products are less valuable during this period as they have difficulty predicting convective type clouds and frequently overforecast the winds.

Thunderstorms: Most thunderstorm activity occurs from the middle of May to the end of August with the greatest activity in July and August. Climatologically, thunderstorms can be expected on an average of six days per month. This figure is extremely deceptive since a great deal of activity occurs in the local area which is not reported at the base. A more representative statement would be that there are between 15 and 18 days per month with thunderstorm activity in the local area. By far, most of the thunderstorms are of the garden variety. About one or two moderate thunderstorms can be expected per year. Only one severe thunderstorm has been noted during the past thirteen years. Hail is a rare occurrence and only pea size activity has been noted.

Moderate and severe activity is frequently noted on the radar and does occur in the hills to the west and on the east side of the lake. Evidently the hills to the west have a stabilizing effect on the activity at the station.

There are two distinct types of thunderstorm activity that can be expected at the station; air mass and frontal.

Air mass thunderstorms usually occur during the afternoon and early evening, are isolated cells, and do not produce heavy activity. A lifted index of +5 or less or a showalter index of +4 or less is a good indicator of thunderstorm potential.

Frontal thunderstorms, as the name implies, usually occur ahead of a front, assuming conditions are satisfactory. They may occur at anytime of day or night, form lines, and are much more active than air mass types. They are frequently observed as moderate to severe areas on the radar ahead of the surface frontal system. The lines can be tracked on radar for several hours. For east-west fronts moving south thru Canada note the lifted index ahead of the front on the composite moisture chart. Frontal thunderstorms usually end with the passage of the front unless there is a distinct surface trough west of the front.

Be sure to monitor the radar frequently during the summer even though we are in a clear area. Activity can develop rapidly in the mountains, often in twenty minutes or less. Cells of questionable intensity passing the base can, under certain conditions develop rapidly as soon as they reach the lake.

<u>NOTES</u>: 1. Thunderstorm should have a vertical height up to at least the -21^{o} isotherm.

2. A cold trough at 500mb passing thru the area is a good indicator.

3. Extensive subsidence inversions will preclude extensive thunderstorm activity.

4. Lifted index of +5 or less and showalter index of +4 or less are good thunderstorm indicators.

Haze: This is the most serious visibility problem during the summer months. To occur, the area is dominated by a mT air mass with southerly wind flow for at least two days. By the second day visibilities will begin to decrease below three miles. Evidently, pollution is advected into the area from the southwest. Minimum visibilities of as low as two miles may occur near sunset and sunrise. During hours of darkness visibilities are usually greater than three miles.

Lake Breeze: This is a frequent occurrence during the late spring and summer. With the onset of the lake breeze, wind directions will frequently reverse and a cap will be put on any further temperature rise. Objective forecast studies available at the station are a valuable aid in forecasting this condition.

Occlusion Passage: The heaviest and most extended period of rain during summer occurs with the passage of an occlusion oriented north-south through the Plattsburgh area. The system is usually slow moving with nearly parallel upper air flow ahead of a deep trough through the central U.S. Frequently the frontal system is either analyzed as a cold front or in some cases dropped entirely in the local area. This is one case where a local surface analysis is extremely valuable. Another indicator is the location of the most unstable air behind the surface position of the front.

The over-running of the moist maritime air mass ahead of the system is frequently not evident from the upper pattern. Since heavy rain is not present in western New York with this system, it is difficult to forecast the extensive precipitation pattern in eastern New York. The major low associated with the occlusion is located in Canada well north of the boarder. Light to moderate rain may occur for up to eight hours after frontal passage with ceiling 1500 to 2000 feet and visibilities 2-3 miles. Thunderstorm activity may occur along with the heavier rain, depending on the stability factor.

FALL WEATHER REGIMES

There are not distinct fall weather regimes at Plattsburgh. Flying weather is the best of the year. Polar air begins to move south again gradually displacing the Bermuda High southeast into the Atlantic. Low pressure systems are displaced further south along with the polar jet. Due to the transitional nature of the weather systems the forecast problem becomes far more subjective. For example, thunderstorms are more difficult to forecast since the stability index no longer gives a definite indicator of the whole air mass. Precipitation types become a distinct problem toward the end of the season when the dividing line between liquid and solid precipitation is extremely narrow. The problem is further complicated by the fact that the ground is still unfrozen. Lower clouds increase markedly by November with ceilings frequently below 3000 feet during the day. A light southeasterly flow shortly before daylight periodically lowers conditions below 1000/2 for short periods of time. Stratus is advected off the lake up over the runway complex. This is very difficult to forecast accurately.

WINTER WEATHER REGIMES

Climatology: Winter is the season of the poorest and most extreme weather conditions. Again the location of the polar jet along with the upper air troughs and ridges is the key forecast factor. The LFM forecasts have been extremely helpful in forecasting the development and movement of major systems thru 48 hours. Extreme conditions are closely related to the detailed location and movement of the major weather system. Local area analyses are particularly important during the winter months.

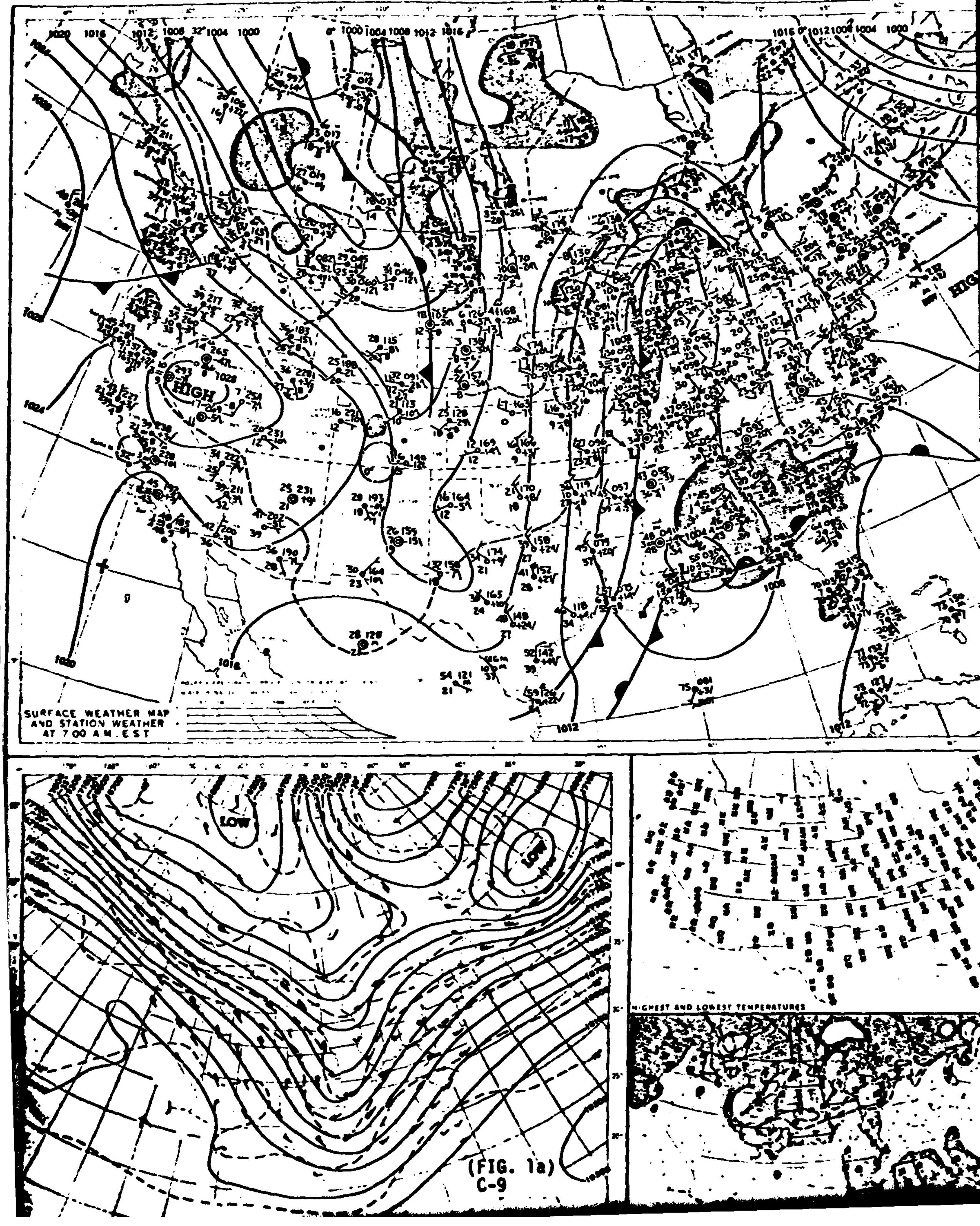
Hatteras Lows: The Cape Hatteras low situation gives Plattsburgh its heaviest snowfall and most extended periods of poor weather. Fairly accurate forecasts for the onset of heavy snow can often be produced ten to twelve hours in advance. The following three conditions are required for the development of these lows.

1. A low moves into the Hatteras area and deepens or forms in the area with rapid deepening.

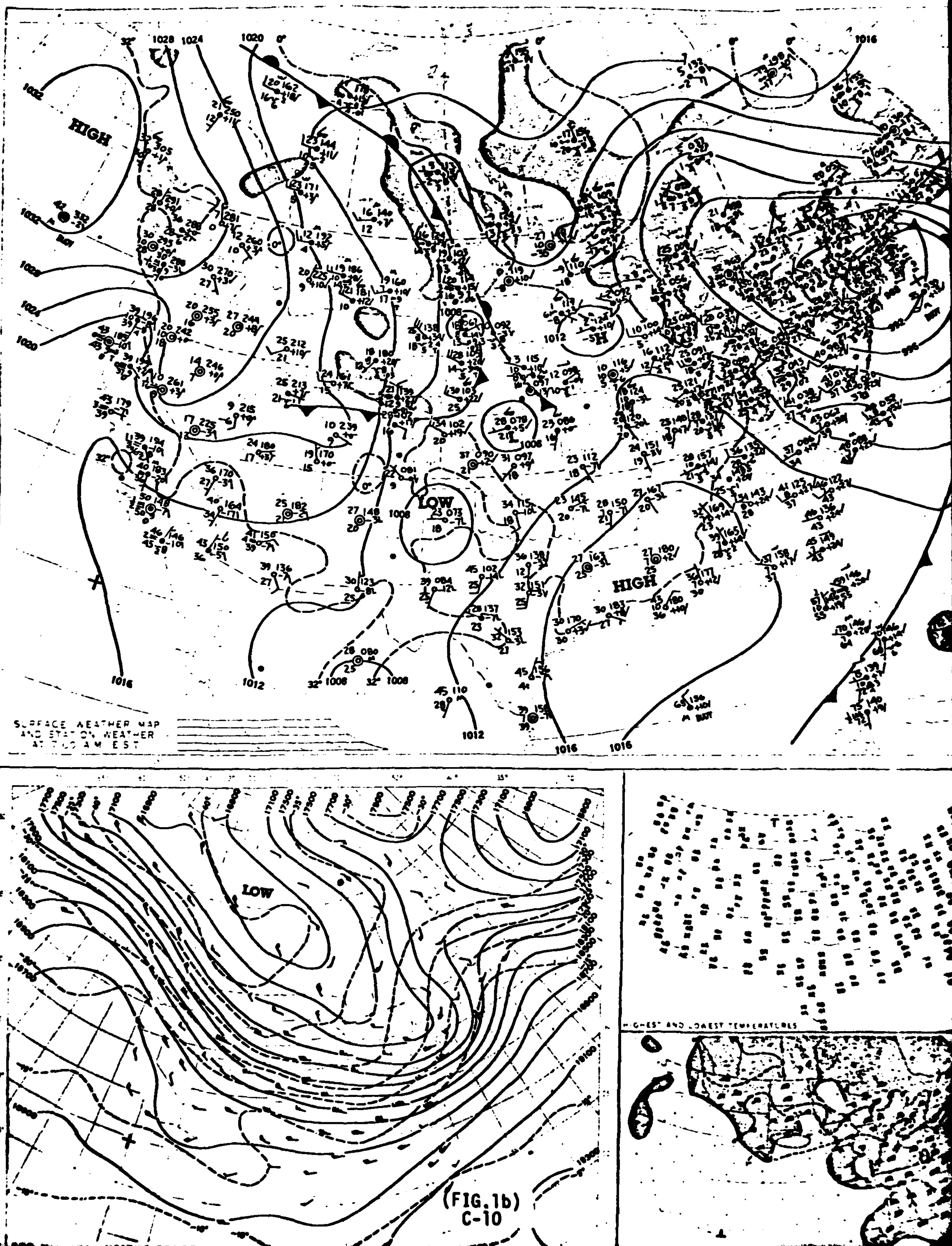
2. A strong southwesterly 500 milibar jet is located over the deepening low, with a major 500 millibar trough through the Ohio Valley.

3. Strong vorticity advection into the developing low is required. The low will be moved in the direction of the 500 millibar jet. The LFM charts will frequently give 36 to 48 hour indications of the low development. There are three general types of a Hatteras low depending upon the origin of the original low.

Type I. (See Fig. 1) A low with an occluding frontal system develops over northeast Texas and moves northeast over Kentucky, West Virginia and


SURFACE WEATHER MAP AND STATION WEATHER AT 7:00 A.M. E.S.T
HIGH
HIGH
LOW
LOW
HIGHEST AND LOWEST TEMPERATURES

(FIG. 1a)


HIGH
LOW
HIGH
SURFACE WEATHER MAP AND STATION WEATHER AT 7:00 A M EST
1028
1024
1020
1016
1012
1008
LOW
HIGHEST AND LOWEST TEMPERATURES

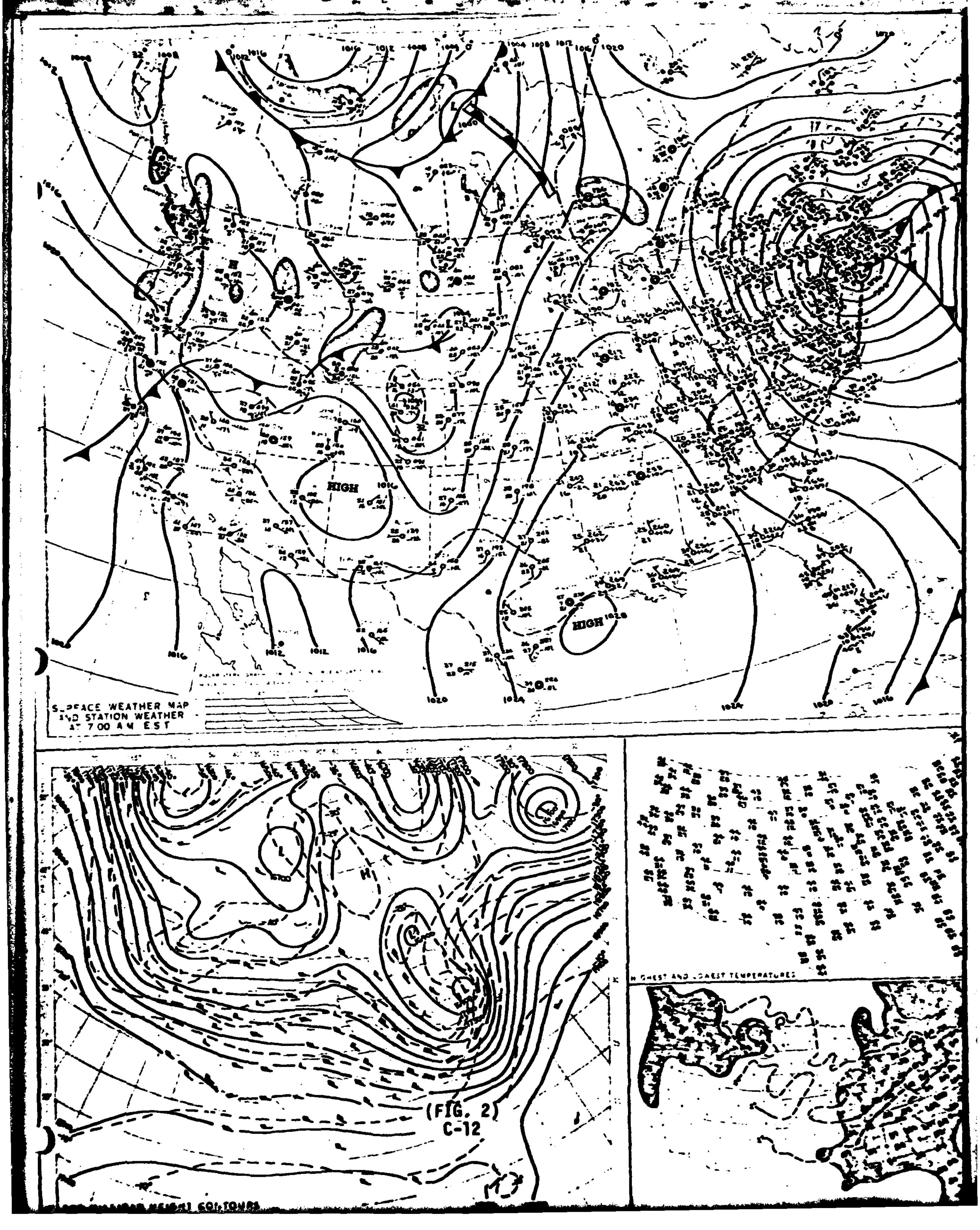
(FIG. 1b)

C-10

Pennsylvania. When the warm front arrives over Cape Hatteras a break-off low develops and rapidly deepens. A 500mb jet is required over the Hattera area. The original major low in Pennsylvania is located under the 500mb trough and rapidly fills and dissipates. Snow associated with the major low continues into central New York and dissipates. The Hatteras low becomes the major system and moves with approximately 80% of the 500 millibar flow. Snow usually begins when the low reaches the latitude of New York City although this is not a firm rule. Snow will begin earlier when there is an extensive inverted trough on the surface extending NNW from the low center. Total accumulation of snow at Plattsburgh depends upon the track of the system. If the low moves north through Vermont or New Hampshire, twelve or more inches of snow may be expected. When the track is through eastern Maine, six to twelve inches should be forecast. A course east of Nantucket will produce two inches or less. In short, the low must pass to the west of Nantucket.

Type II (See Fig. 2). A low develops under the 500 millibar jet in South Carolina or Georgia. As it moves off the coast in the Hatteras area, it deepens rapidly as in Type I and moves up the coast with the 500 millibar flow. Weather conditions are similar to those described in Type I.

Type III. A weak low may also develop along the north Florida coast or Gulf and track north to the Cape Hatteras area. Under favorable conditions it too will rapidly deepen in this area and track north along the Atlantic


SURFACE WEATHER MAP
AND STATION WEATHER
AT 7:00 AM EST
HIGH
HIGH
HIGHEST AND LOWEST TEMPERATURES
HEIGHT CONTOURS

(FIG. 2)

C-12

coast with the upper air flow.

In all cases described above, extreme care must be exercised in tracking the system north. In addition, conditions must be such that snow will be the predominant precipitation type. If the low is forecast east of Nantucket, little serious weather should be forecast. Oftentimes lows will develop in the Cape Hatteras area which are not true Hatteras lows. This is especially the case when a vertical low just west of the Appalachians moves north through New York. The strong southwesterly jet over the Hatteras area is of primary importance. Strong northerly winds aloft must be present in the Mississippi Valley.

Weather associated with the true Hatteras consists of ceilings of 200 to 500 feet with visibilities of 1/4 to 1 mile at the onset of precipitation, continuing until the low passes north of 45°N or the wind shifts to a northwesterly component. Weather deterioration is rapid with the onset of snow while improving weather can be expected within one hour of the shift in winds to a northwesterly component. Frequently, gusty northerly winds behind the system will lower visibilities to 1/2 mile in blowing snow. Drifting then becomes a serious snow removal problem.

The Texas Low: The Texas low, as the name implies, develops in Texas in the panhandle region and moves rapidly east to northeast along with the 500 millibar flow pattern. A moderate north-south trough at 500 millibars is located in the central United States. Moist air tends to be advected over the eastern U.S. resulting in a possibility of freezing precipitation in northern New York. The amount of snow expected depends upon the track of the storm.

1. A track north of Pittsburgh - Cape Cod line and south of Plattsburgh can produce 4-6 inches of snow. Clearing may be expected when the low center moves off the coast or north of 45^{o}N.

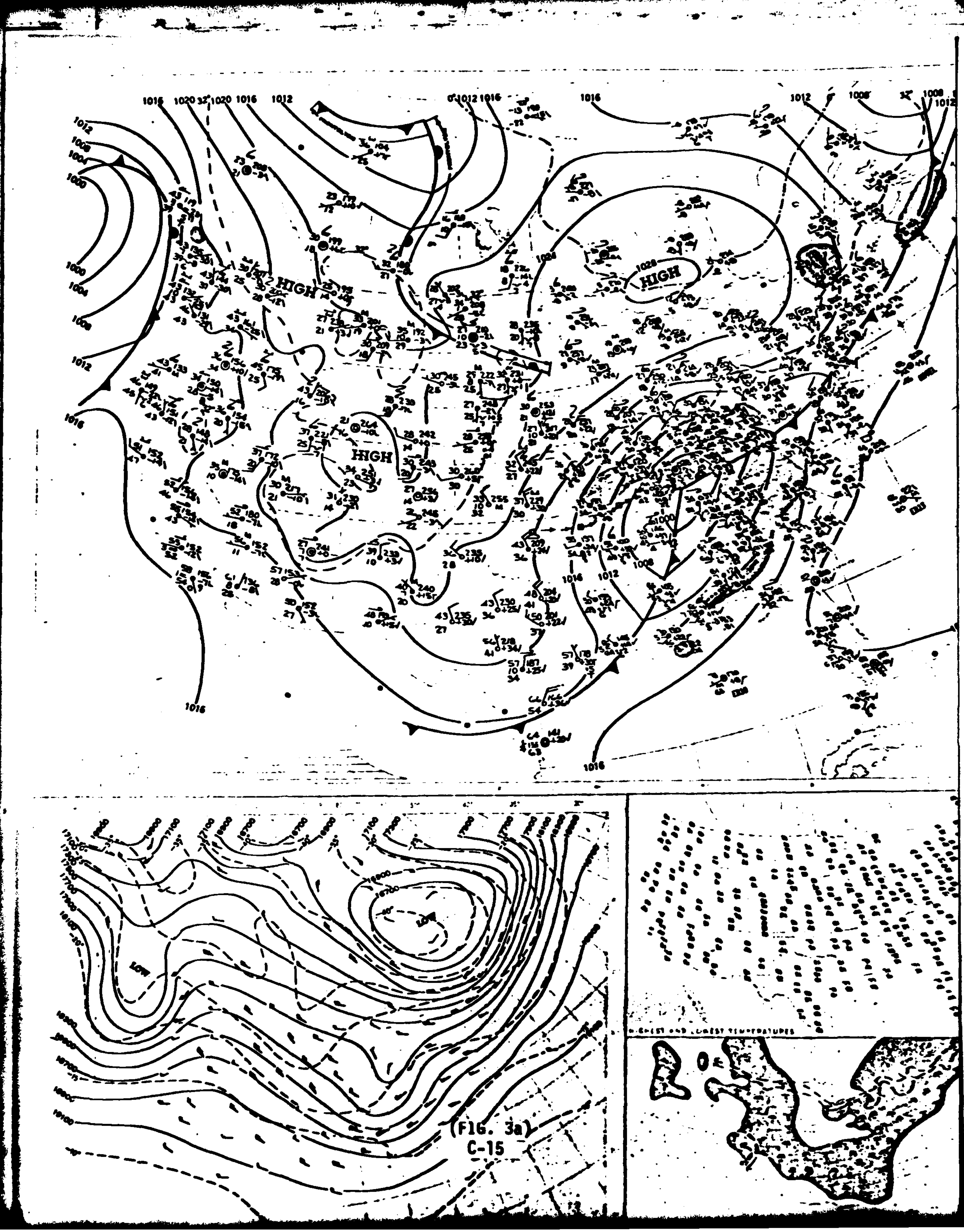
2. If the storm tracks south of a Pittsburgh-Philadelphia line, (See Fig. 3), little or no precipitation should be forecast.

3. A movement north or west of Plattsburgh along the Saint Lawrence River will (See Fig. 4) usually result in freezing precipitation or rain, depending upon conditions at the surface and aloft. Clearing can be expected after the cold frontal passage.

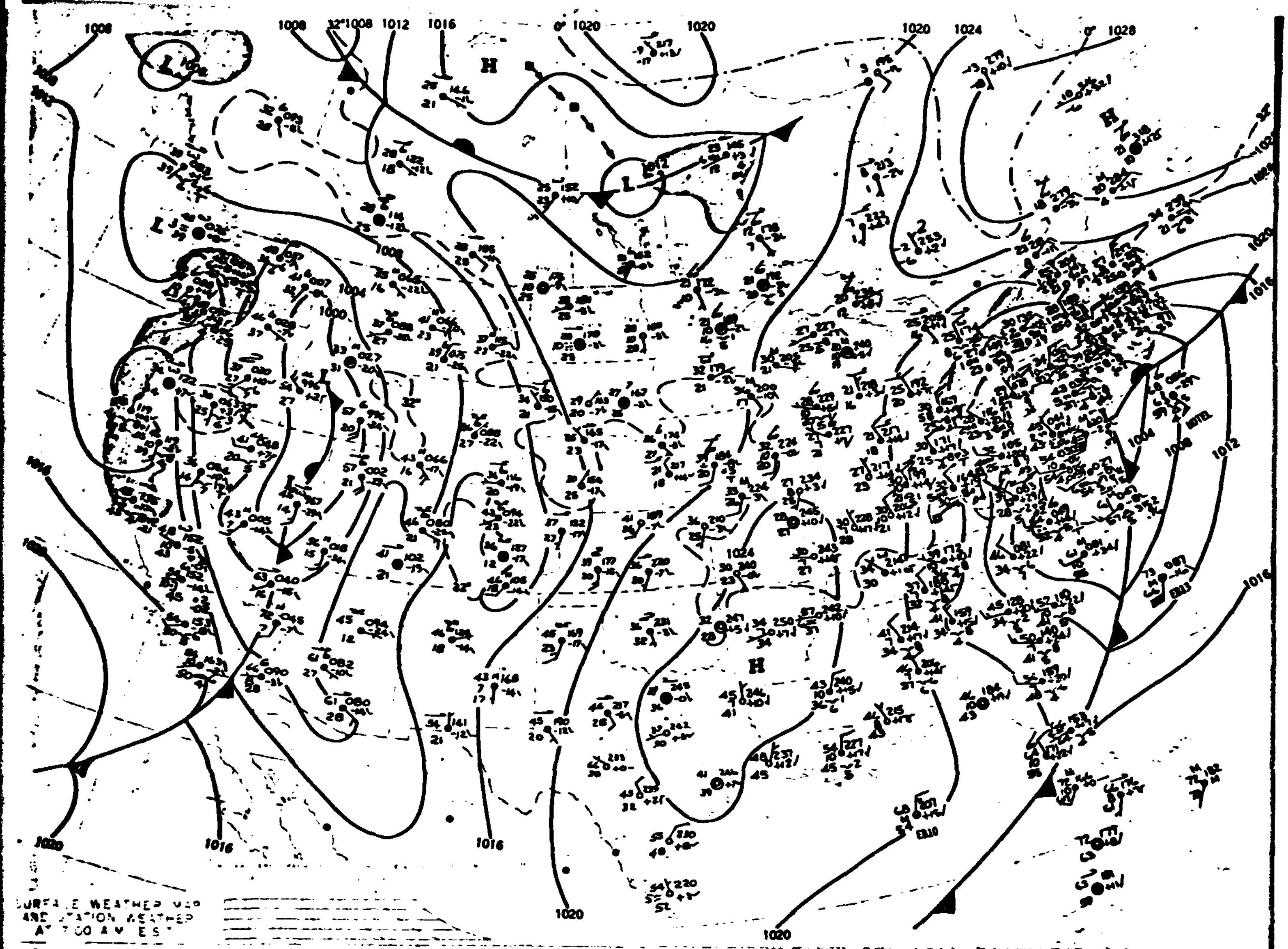
Great Lakes Low: (See Fig. 5) The low will develop just east of the Rockies from the Alberta area south through the Dakotas. The upper air flow tends to be zonal with rather strong 500 millibar winds from 300 to 240 degrees across the northern United States. The low will deepen slightly and move rapidly east across the Great Lakes. Again weather conditions depend upon the track of the system in the Plattsburgh area.

1. A track over or somewhat south of the base can produce up to three inches of snow. Freezing precipitation possibilities increase the further south the system tracks.

2. A track north of the base, snow amounts decrease rapidly with merely a trace if the track is 100 to 150 miles north of Plattsburgh. Most of the snow occurs 6-7 hours ahead of the cold front ending with the frontal passage. This is one of the most common winter situations with several similar systems passing the area at 24 to 36 hour intervals.



(FIG. 3a)


1008
1012
1016
1020
1024
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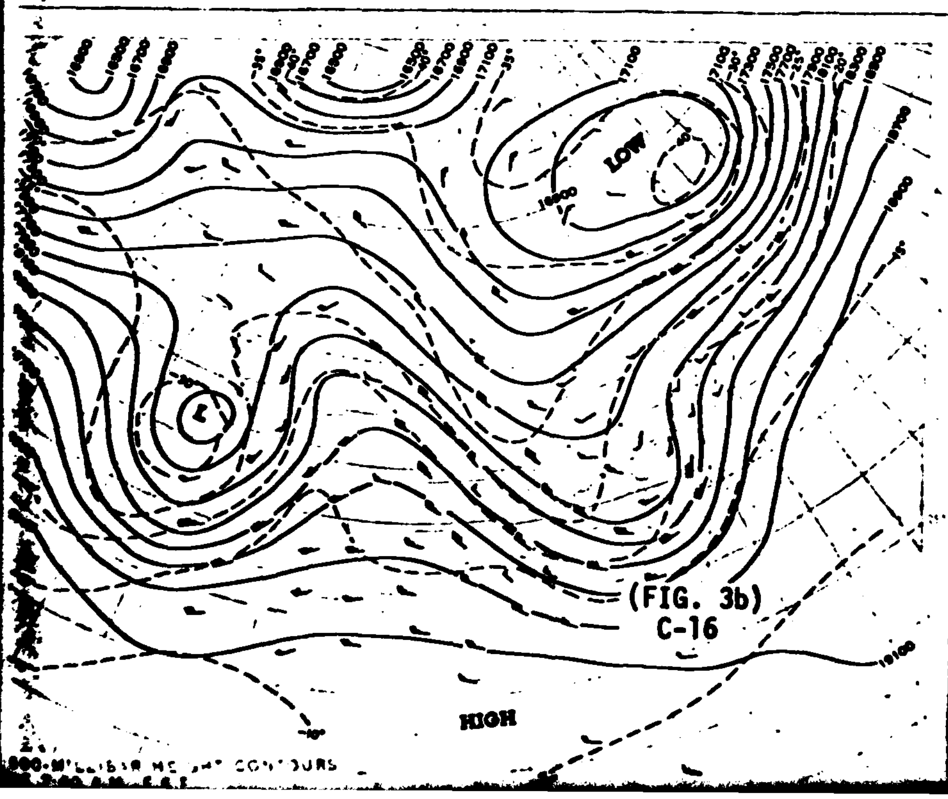
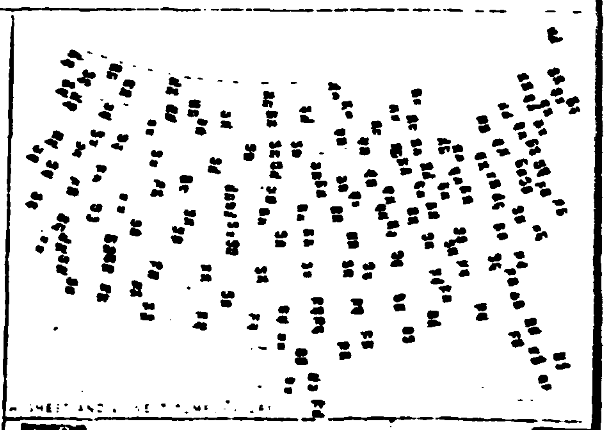
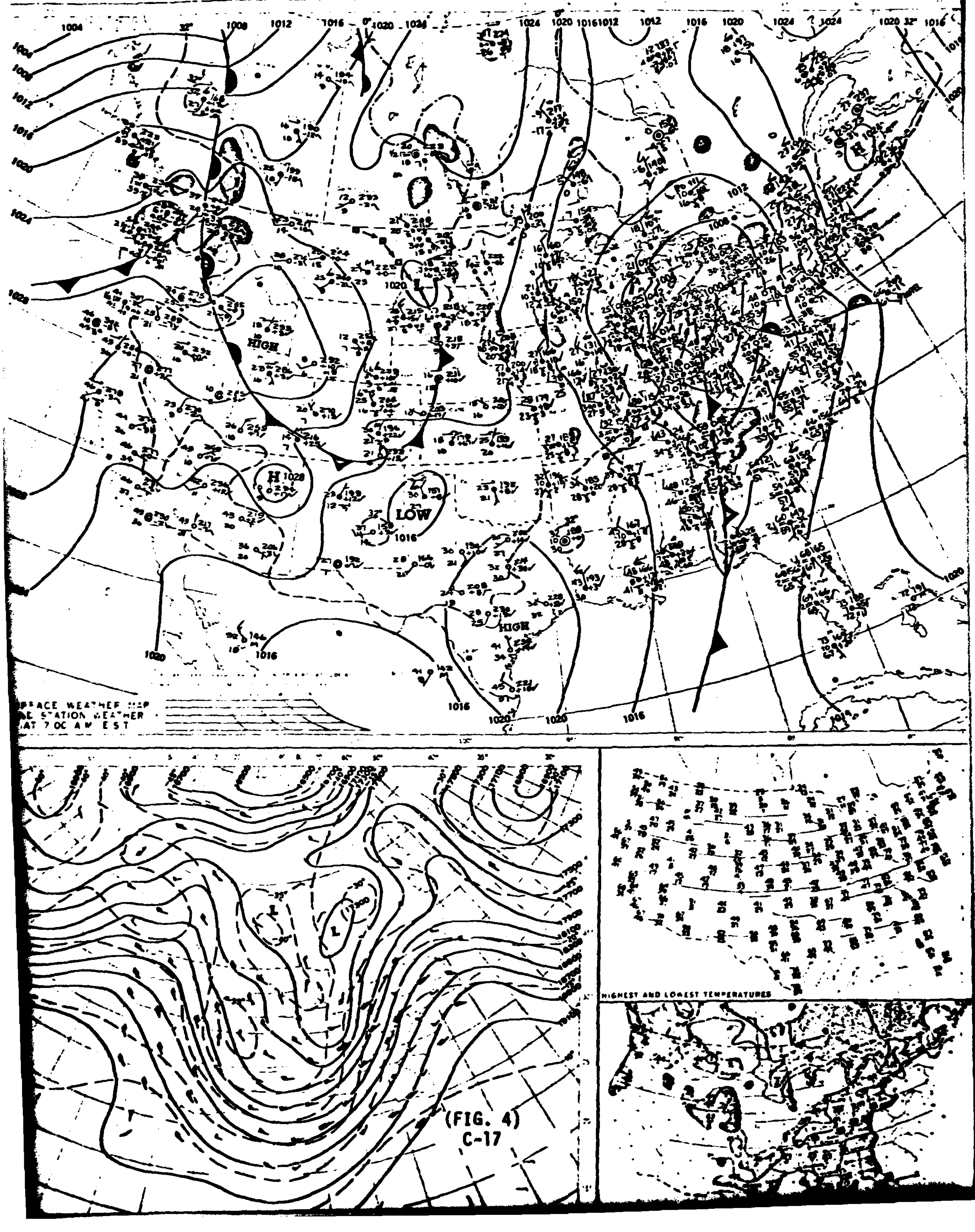
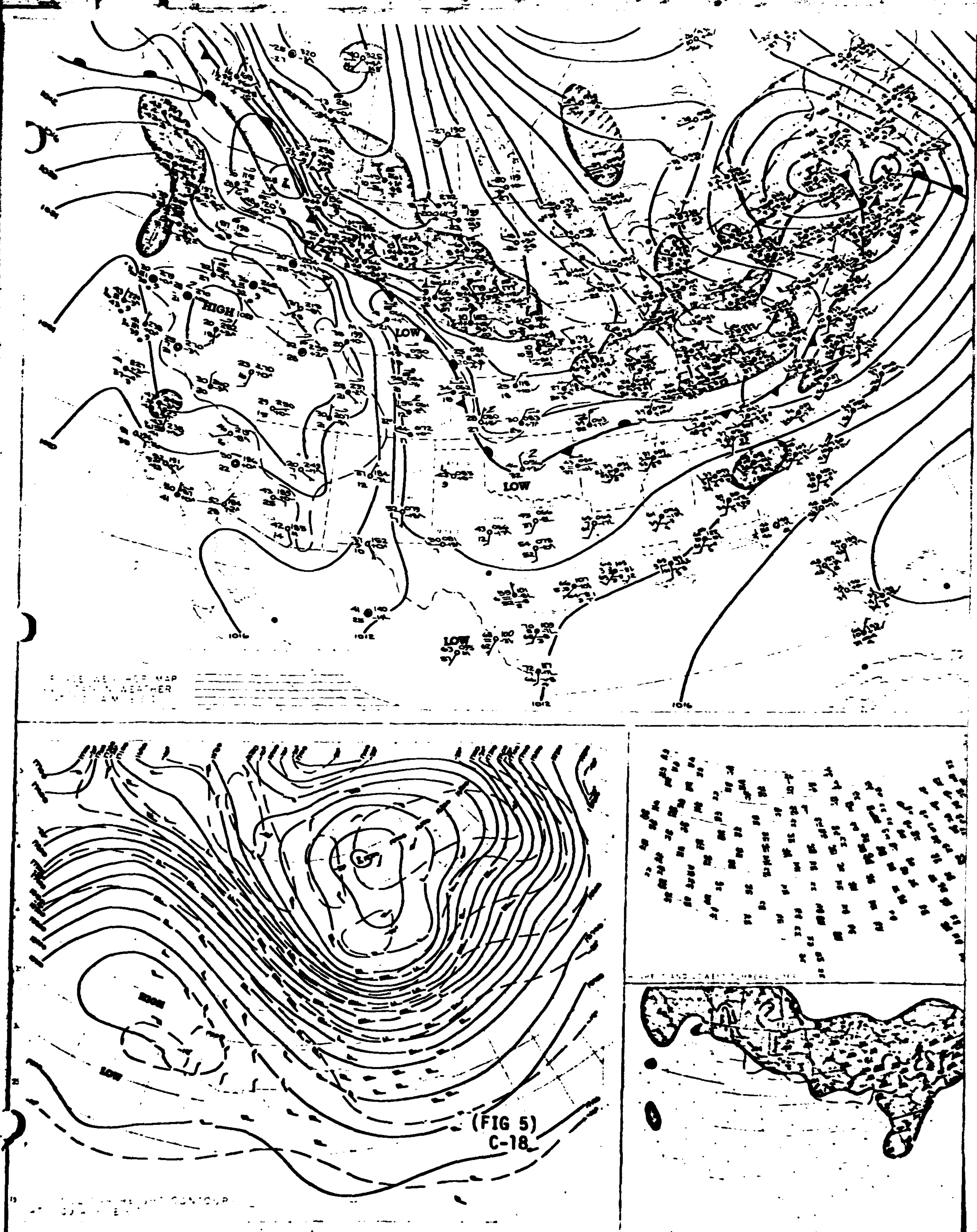

LOW
HIGH
L
18000
17100
19100



(FIG. 3b)


RFACE WEATHER MAP
E STATION WEATHER
AT 7:0C A M E S T
HIGH
LOW
HIGHEST AND LOWEST TEMPERATURES

(FIG. 4)
C-17



(FIG 5)
C-18

LFM charts will indicate relatively accurate forecast positions since the systems move rapidly across the country with rather simple frontal configurations.

Freezing Precipitation: Freezing precipitation can occur from November to March with the most frequent occurrences in December thru February. This phenomena is extremely critical to the flying operation and requires intensive analysis and forecasting. The forecast study included in the TFRN has been found to give excellent results. The graphs essentially key the forecaster to the good possibility of freezing precipitation. When critical conditions are indicated, more detailed analysis of the 850mb charts and the surface charts should be initiated. Remember surface temperatures are critical. Activity may occur with temperatures from 20 to 34 degrees. Good warm air advection at 850mb is also required. Heavy icing in the lower layers must be considered. Tip: When a forecast for freezing precipitation is decided upon do not cancel until the original conditions change. The activity is generally widely scattered and exact timing at the station is difficult.

Gusty Surface Winds: Surface winds greater than 34 knots will occur periodically during the winter season. The following rules will apply to winds during the spring and fall although the occurrences are somewhat less. No truly objective method has been developed to forecast these conditions. However there are several critical factors that can give a preliminary indication of strong surface winds.

When a stong north-south cold front moves thru the area with 850mb winds of 40 knots or more behind the 850mb frontal position, strong gusts are likely. Relatively warm air is required ahead of the front and strong cold air advection behind the front. The strong winds will usually occur with the arrival of good cold air advection. This could be serveral hours behind the front. Watch for one or two strong gusts with FROPA and then cessation of strong wind until arrival of cold air.

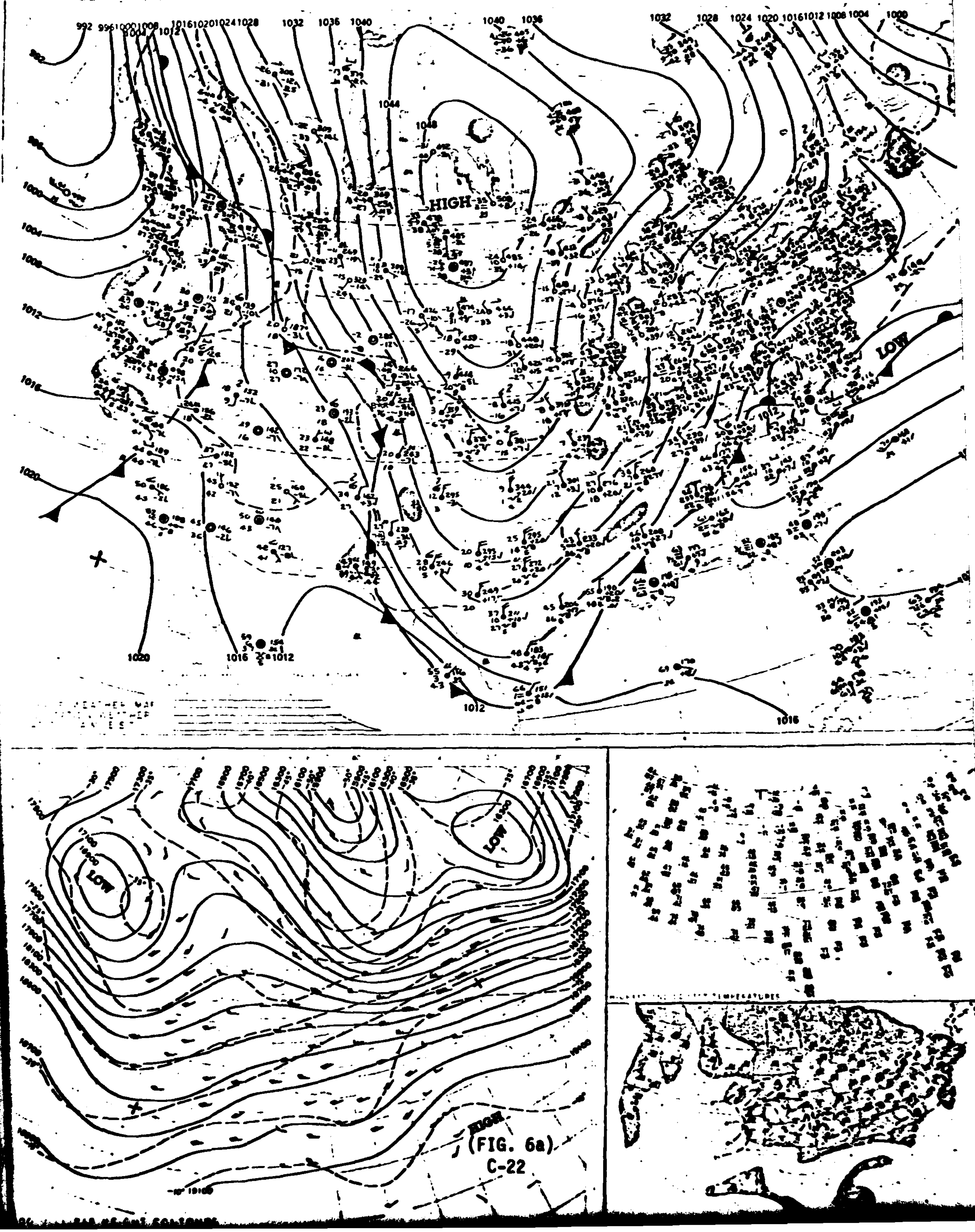
A second clue is the movement of a strong low pressure system between James Bay and Northern New York. Frequently a cold front is associated with this system. The above winds are usually from a westerly component and present a serious cross wind problem. Surface winds at Watertown are frequently a first clue to the onset of these conditions.

A less common condition is a wind from the south. This usually developes with the passage of a warm front through the area. A deep low is found in the Great Lakes region with a strong high off the Maritimes. Strong gusts from this wind direction are difficult to forecast as there are very few clues available.

Polar Outbreaks: (See Fig. 6) During the winter months several polar outbreaks can be expected. Temperature will remain below zero during the day with temperatures of below -20 degrees at night likely. At the onset of these conditions, strong northerly winds can be expected resulting in very low equivalent chill temperatures. If the system persists the winds will gradually decrease and clear skies will dominate the area.

The most extended period of polar outbreaks often occur with the passage of a Hatteras low. The 500 millibar pattern indicates a rather strong stationary ridge over central Canada. The surface high builds in northwestern Canada and moves slowly east across southern Canada.

A second less extended outbreak develops with a deep trough over the central United States at 500 millibars. A cold high moves south over the central U.S. Relatively warm temperatures prevail at upper levels. However, with weak surface gradients and clear skies, radiational cooling at night will lower temperatures to -20°, while heating during the day associated with clear skies will tend to increase temperatures rapidly into the teens and low twenties. The rapid temperature rise during the day is due to the rather shallow surface inversion which develops during the night. Frequently, a sharp drop of five degrees in the temperature is recorded just after sunrise. In both cases the cold temperatures will persist until the ridge moves east of the local area and the surface winds shift to a southerly component.


992
1000
1004
1008
1012
1016
1020
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1028
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1036
1040
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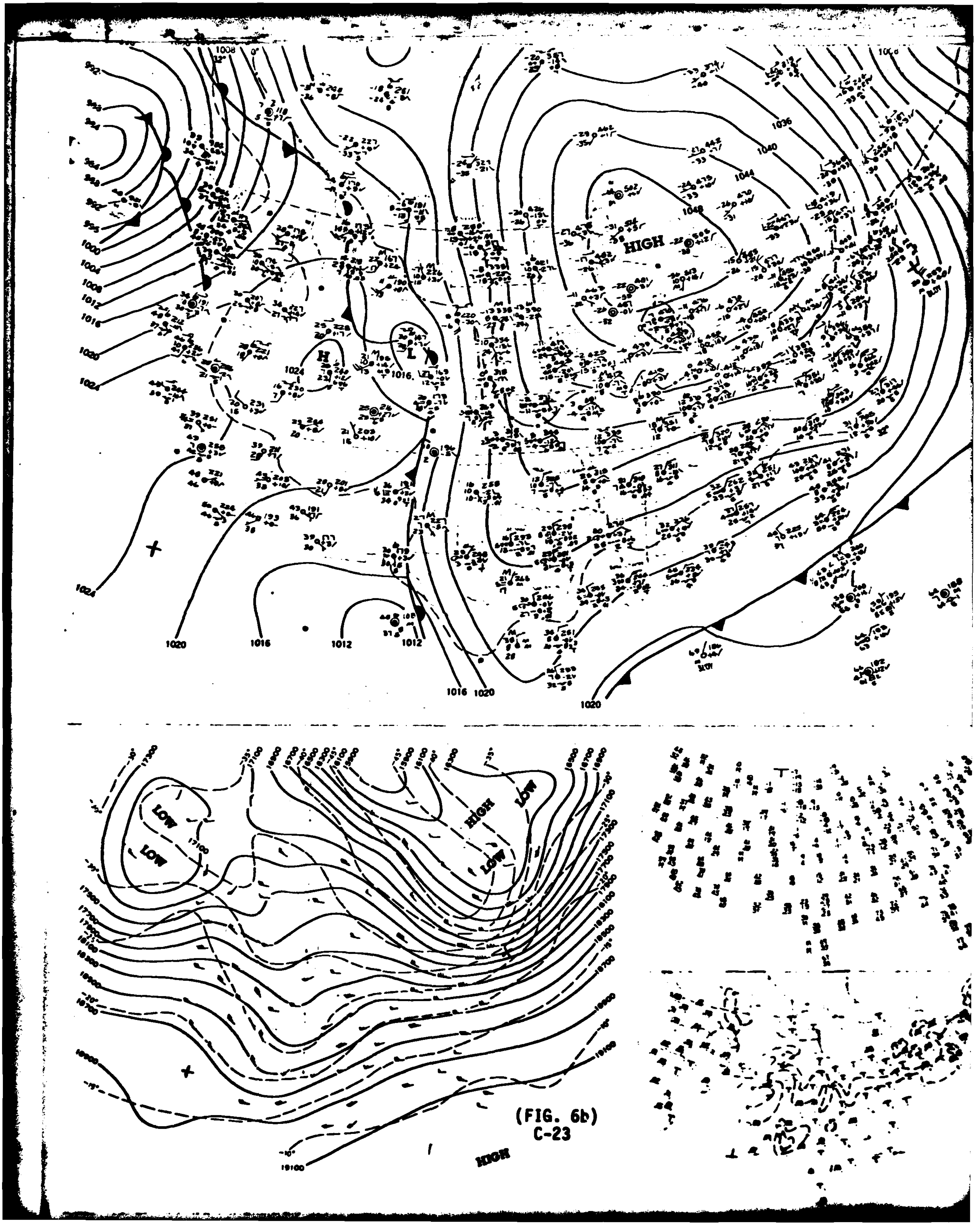
HIGH
LOW
HIGH
LOW
LOW

(FIG. 6a)

C-22


HIGH
H
L
1020
1016
1012
1016
1020
1020
1024
1036
1040
1044
1048
LOW
LOW
LOW
LOW
HIGH
HIGH
17100
19100

(FIG. 6b)
C-23

SPRING WEATHER REGIMES

Spring has no definite weather regimes. The winter situations tend to persist into March and at times April and early May. Rain gradually becomes the predominant precipitation type. The Hatteras low is probably the most important type with heavy rain often a feature of this system, particularly in mid-Spring. Forecasting becomes more subjective since the temperature and air mass characteristics are neither summer nor winter. Severe weather becomes less frequent as the polar jet moves north producing frequent wave passages in the norther New York area. The Bermuda High tends to build over the eastern U.S. resulting in improving weather toward the end of the period.

SECTION D

LOCAL FORECAST AIDS

FORECAST STUDIES

RULES OF THUMB

PRECIPITATION TYPE STUDY FOR PLATTSBURG AFB

June 1976

BY: James E. Lombard, GS-11

1. References:

a. Wasserman, Stanley E., "Forecasting Type of Precipitation," NOAA Technical Memorandum NWS ER-45, Jan 1972.

b. Wasserman, Stanley E., "Forecasting Type of Precipitation," Technical Attachment No 72-12-18, Eastern Region, 18 Dec 72.

c. Technical Procedures Bulletin No. 49, No. 70.

d. USAFETAC Technical Note 71-2.

2. Introduction: References 1a and 1b outline a technique developed by Wasserman to forecast type of precipitation using FOUS (detailed P.E. guidance) data (reference 1c and d) for the Eastern United States. The method is relatively simple in that the 1000-500mb thickness and mean boundary layer potential temperature forecasts by the P.E. model and used as predictors in an objective procedure for forecasting precipitation type out to 48 hours.

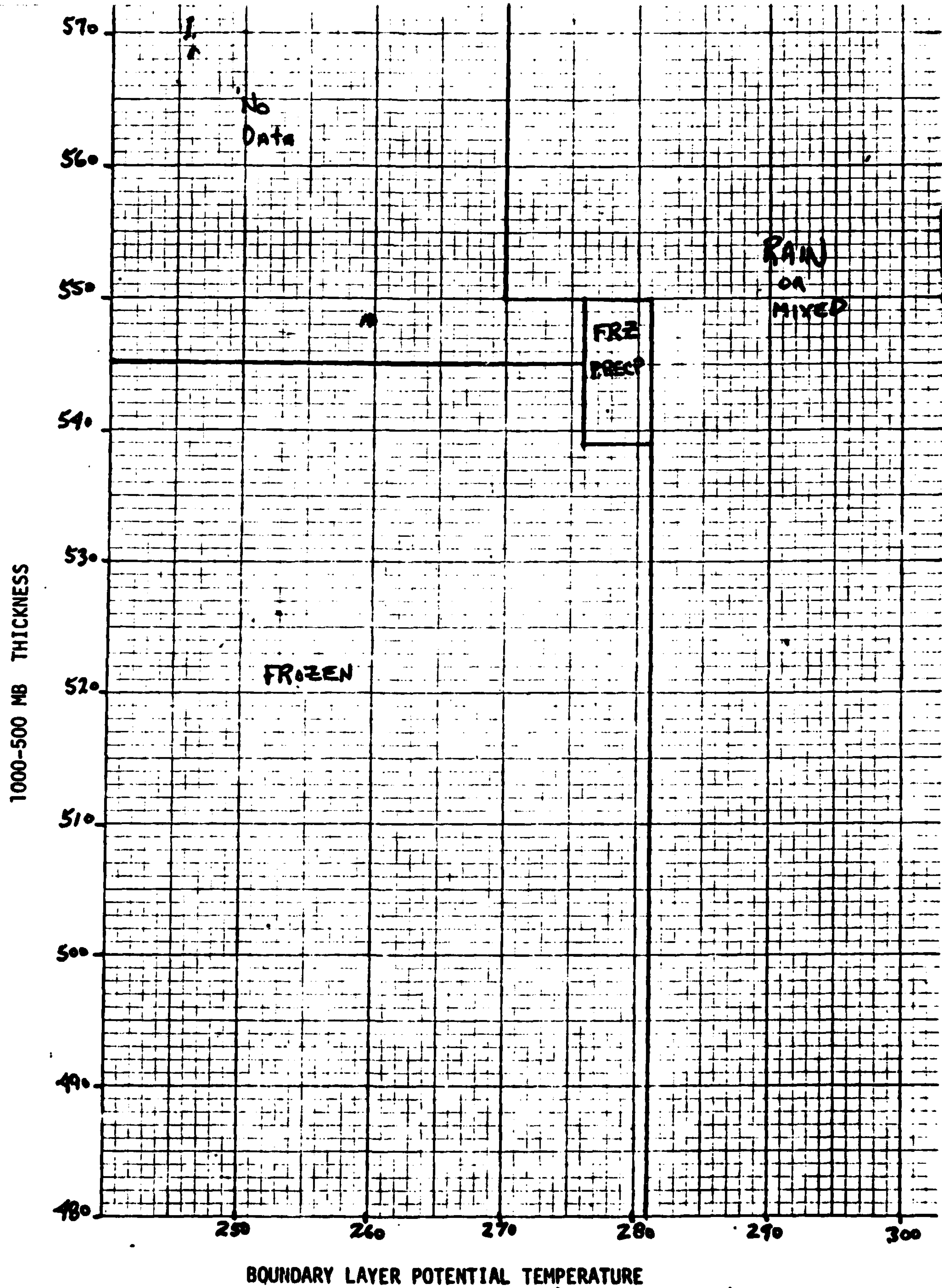
3. Analysis and Results: The 12 and 18 hour FOUS (BTV) 1000-500mb thickness (HH) and mean boundary layer potential temperature (TB) data and observed Plattsburgh weather for the period Feb 74 to Apr 74 were used to develop scatter diagrams. Precipitation types were divided into three categories, i.e. frozen, liquid and mixed, and freezing rain/drizzle, and plotted against the forecast values of HH and TB. Lines separating the precipitation categories were then drawn establishing the forecast limits/values. These values were then used to independently test the method for the 74-75 winter season (i.e. Nov 74-Apr 75) and 75-76 winter season. Verification for these two seasons are shown in tables (Atch 2, page 4-B-4). (Precipitation types observed within ±3 hours of the forecast valid time were used to verify these forecasts.) Results from these independent tests indicate that this study can be used with confidence to forecast precipitation types at Plattsburgh AFB.

4. Forecast Procedure:

a. Determine 12 and 18 hour values of 1000-500mb thickness (HH) and the boundary layer temperature (TB) from the BTV FOUS Bulletin.

b. Enter the scatter diagram (Atch 1, page 4-B-3) to determine forecast type.

c. The forecast method can be improved by modifying for expected low level temperature changes. For example if liquid precipitation is forecast and below freezing temperatures are expected then freezing precipitation should be forecast.


No Data
RAIN OR MIXED
FRZ PRECP
FROZEN
1000-500 MB THICKNESS
570
560
550
540
530
520
510
500
490
480
250
260
270
280
290
300
BOUNDARY LAYER POTENTIAL TEMPERATURE

ATCH 1

FORECAST RESULTS INDEPENDENT DATA*

12 Hour Forecast

	Liquid/Mixed	Frz R/L	FROZEN	TOTAL
Liquid/ Mixed	22/24/46*	3/8/11	5/3/8	30/35/65
FRZ R/L	1/ 0/ 1	2/3/ 5	0/3/3	3/ 6/ 9
FROZEN	1/ 1/ 2	4/3/ 7	64/53/117	69/57/126
TOTAL	24/25/49	9/14/23	69/59/128	109/98/200

% correct = 86.3/81.6/84.0
Heidke Skill Score = .708/.667/.686

	Prefigurance (%)	Post Agreement (%)
Liquid/Mixed	73.3/68.6/70.8	91.7/96.0/93.9
FRZ R/L	66.7/50.0/55.6	22.4/21.4/21.7
FROZEN	92.8/93.0/92.9	92.8/89.8/91.4

18 Hour Forecast

	Liquid/Mixed	Frz R/L	FROZEN	TOTAL
Liquid/ Mixed	30/27/57	5/7/12	6/1/7	41/35/76
FRZ R/L	1/ 0/ 1	4/3/ 7	0/4/4	5/ 7/12
FROZEN	0/ 2/ 2	3/0/ 3	57/53/110	60/55/115
TOTAL	31/29/60	12/10/22	63/58/121	105/97/202

% correct = 86.6/85.6/86.1
Heidke Skill Score = .751/.736/.743

	Prefigurance (%)	Post Agreement (%)
Liquid/Mixed	73.1/77.1/75.0	96.8/93.1/95.0
FRZ R/L	80.0/42.9/58.3	33.3/30.0/31.8
FROZEN	95.0/96.4/95.7	90.5/91.4/90.9

* Data are presented as 1974-1975/1975-1976/TOTAL

RULES OF THUMB

SUMMER:

1. Forecast a broken ceiling of cumulus clouds during the day when there is good cold air advection at 850mb.

2. When the FOUS 61 bulletin indicates lifted indexes of +5 or less, thunderstorm activity is probable in the area during the afternoon. This is a good rule for the current as well as succeeding day.

3. At the onset of a lake breeze it is possible to have opposing surface winds at opposite ends of the runway gusting up to 18 knots. Watch out for low level windshear in this situation.

WINTER:

1. If there is a possibility of surface winds gusting above 34 knots, put out warning when winds first exceed 30 knots.

2. FOUS 61 Bulletin:

a. Forecast ceiling below 3000 feet when the lower two humidity layers have relative humidity forecasts greater than 95%.

b. Forecast clouds in the upper two layers when relative humidities are greater than 75%.

c. The FOUS 61 Bulletin usually overforecasts precipitation, especially when the low passes to the North.

d. The Bulletin is good bringing in moisture but poor taking it out.

e. The boundary layer wind forecasts are good for determining the timing of frontal passages.

f. The forecast boundary layer wind speed is usually a good estimate of peak gusts.

3. With weak northeasterly winds behind a weak cold frontal passage forecast ceilings and visibilities below 1000/2. A shift to somewhat west of north will dissipate the clouds rapidly. An important but extremely difficult forecast problem caused by flow off Lake Champlain.

4. If a warning for freezing precipitation has been issued do not cancel, until the original conditions definitely change even though no activity has occured for several hours.

GENERAL:

1. Temperature forecasts on the FOUS 61 bulletin are extremely accurate and should be routinely relied upon.

2. When fronts approach the area, use a six hour continuity on the NWS surface charts. LAWCs are usually not too good a method for forecasting a FROPA at PBG.

3. By the time a cold FROPA is noted at MSS, it is imminent at PBG.

4. Other area weather reporting locations are not good indicators of PBG weather due to the tremendous local terrain effect.

5. In general, do not forecast low level turbulence with strong southerly winds.

6. Forecast moderate low level turbulence with west to north winds greater than 20 knots.

7. Due to the tendency for somewhat southwesterly flow as a north-south front approaches the area, forecast surface winds to decrease markedly about four hours ahead of frontal passage.

8. Due to terrain effects, surface winds greater than 10 knots are rare from 210-230 degrees and from 030-140 degrees.